



TECHANGLE FREQUENTLY ASKED QUESTIONS

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WHAT IS A TECHANGLE WRENCH?

The **TECHANGLE™** wrench is an electronic torque and angle wrench. It is designed to provide basic electronic features, including UNITS CONVERSION, (Nm, ft-lb and in-lb) TRACK, PEAK HOLD, and PRESET functions on a robust, yet ergonomically comfortable, wrench platform. The ANGLE mode utilizes piezo gyroscope technology that requires no mechanical reference. It is priced to compete with mechanical bending beam, dial, preset and adjustable click-type torque wrenches, and angle gauges.

HOW DOES IT WORK?

The TECHANGLE wrench emulates a mechanical dial or “click” type wrench or reference-free angle gauge for “turn-of-the-nut” type applications. The display shows the torque or angle specification, (PRESET values) that can be changed immediately using the UP and DOWN pushbuttons. The torque units or angular degrees units of measure are selected by using the UNITS conversion pushbutton.

In torque mode, when load is applied the display automatically switches to TRACK mode, emulating a mechanical dial wrench, so the user can monitor torque or angle in real time. Similar to a click type wrench, at 2% below the preset value, the wrench beeps once and the handle vibrates, alerting the user to stop increasing torque. When load is released the display automatically shows the PEAK torque applied for 10 seconds, flashing on and off, thus emulating a dial wrench with a follow-up pointer.

In angle mode, when load is first sensed, the wrench switches to TRACK mode and accumulates fastener rotation in angular degrees. Reverse motion is ignored to allow ratcheting action in tight work places. When load is released the display automatically shows the PEAK angle and torque applied, alternating, for 10 seconds. This is also useful for keeping an eye on torque applied while in the angle measurement mode. Angle will continue to totalize if load is reapplied before the 10-second period has elapsed. If PRESET alert has occurred or the 10-second PEAK display has elapsed or the ON/RESET key is pressed, the wrench is ready to move to the next fastener and start accumulating from zero again.

Note: when entering the angle measurement mode the wrench must be momentarily held still to establish a zero angle reference in space. The display shows two small bars “- -” alternating if motion is detected during zero reset.

The wrench turns itself off after sitting idle for two minutes to conserve battery power. The wrench returns to the last PRESET and UNITS settings at power on.

WHY DOES THE TORQUE ALERT SIGNAL 2% EARLY?

A mechanical click wrench releases torque slightly when its PRESET value is reached. This helps the user to stop applying torque without over-loading the fastener. With the TECHANGLE wrench, the user must ergonomically respond to the beep and handle vibration. Empirical studies showed that the typical user overshoots the PRESET value by about 2%. So, the program

purposely signals torque PRESET alert 2% early to compensate. Refer also to "HOW DOES IT WORK?" above. Note: angle PRESET alert does not signal early.

WHAT IS THE ACCURACY OF THE TECHANGLE WRENCH?

Complying with the ASME and ISO Standards, the TECHANGLE wrench is accurate to within +/- 2% in the CW direction and +/-3% in CCW direction from 20% to 100% of full scale. Refer to the specifications page for more details.

Angle accuracy is within 1% of reading +/-1 degree.

WHAT AFFECTS ACCURACY?

Handhold position: To provide a robust, yet cost effective design, the TECHANGLE wrench uses strain-gaged, bending beam, torque sensing technology. To get the best accuracy, users must apply load to the center of the handhold position. Moving off the center of the handle can induce errors as much as:

MODEL	RANGE	% DISPLAY ERROR		
		DISTANCE FROM CENTER OF HANDLE		
		1" Short	1" Long	2" Long
ATECH2FR100	100 ft-lb	-2.49	1.93	3.44
ATECH3FR250	250 ft-lb	-0.90	1.25	1.79

Although the angle display does compensate for wrench bending, handhold position error of angle measurements is insignificant.

Flex-head position: Because the flex-head can place the center of the socket drive some distance away from the center of the calibration length (non-flexed drive axis to handhold position), compensation for torque setting or display reading may be necessary. Using a deep-well socket, for example, can result in errors as much as:

MODEL	DRIVE	% DISPLAY ERROR		
		+/- FLEX-HEAD ANGLE		
		5 deg	10 deg	15 deg
ATECH2FR100	3/8"	0.35	1.43	3.33
ATECH3FR250	1/2"	0.39	1.64	1.80

Using the flex-ratchet other than in the straight position can result in angle measurement errors by the cosine of the flex angle. For example, at full flex (+/-15 Degrees):

COS 15 deg = 0.97
or
angle readings will be low by about 3% at full flex

Temperature: The TECHANGLE wrench utilizes full-bridge strain gage sensing to provide excellent temperature compensation. The wrench will maintain accuracy per ASME STANDARDS at room temperature (23 degrees C) +/-10 degrees C. Electronic display drift is

+0.01% per degree C. The piezo gyroscope, used for angle measurement, drift is –0.12 angular degrees per Degree C.

Orientation: As with all bending beam, and most click style torque wrenches, the TECHANGLE wrench is sensitive to gravity induced torque error. Torque wrenches are calibrated in the vertical position (handle down) or horizontal position (drive facing down) orientations. When the wrench is used in a horizontal position, with the drive parallel to the surface of the earth, setting and display errors can be off as much as:

Model	Horizontal Orientation Error		
	CW	CCW	UNITS
TECH2FR100	-0.2	0.2	ft-lb
TECH3FR250	-1.0	1.0	ft-lb

Angle measurement is not affected by gravity or magnetic forces.

HOW CAN I CHECK THE ACCURACY OF THE TECHANGLE WRENCH?

Per ASME B107.28 and ISO 6789 Standards, checking the accuracy of a torque wrench requires the use of a torque tester/calibrator with accuracy at least four times better than that of the wrench. The TECHANGLE wrench is calibrated in the horizontal position, with the display facing up. Per the Standards, the wrench must be exercised three times to full scale in the direction of test and then both the wrench and tester/calibrator must be zeroed. A constant torque is applied, (TRACK mode on the tester) by loading at the mark on the handle, and with the flex-head straight (non-flexed). Never try to test the wrench in the PEAK or FIRST PEAK modes because the dynamic differences between the wrench and the tester will produce inconsistent results. The Standards suggest checking the wrench at 20%, 60% and 100% of full scale. Wrench readings should match the tester display within the sum of the uncertainty specifications for each. For example, a +/-2% wrench tested using a +/-0.5% tester is within specification if the readings agree within +/-2.5%. A number of torque testers/calibrators are available from Snap-on Tools.

Presently no ASME or ISO Standard for angle measurement exists. However, the TECHANGLE wrench is calibrated and checked using a N.I.S.T traceable protractor fixture.

CAN I CALIBRATE THE WRENCH MYSELF?

Yes, with the proper calibration equipment. Refer to Calibration Instructions at home page.

HOW OFTEN SHOULD THE WRENCH BE CALIBRATED?

This question relates to the policy of the particular user, which generally reflects the critical nature of specific fastener installations. Obviously, military, aerospace and nuclear power facilities will test their wrenches more often than a backyard mechanic. The TECHANGLE wrench was designed and tested to comply with ASME and ISO torque Standards for cycle life. The Standards require 5,000 CW and CCW cycles at full-scale without loss of accuracy. To establish your own policy, as an example, using a 100 ft-lb wrench to install lug nuts to 100 ft-lb, you can reliably do 250 automobiles before checking calibration, (5,000 lug nuts / 5 lugs / 4 wheels = 250 cars). If you use the wrench at mid-scale, you can expect to get at least 4 times the cycle life. At any extent, due to environmental affects, even if the wrench is only used occasionally, it is good practice to have it checked every six months. As with any measurement instrument, should you drop it, have it checked. Snap-on Repair Centers are outfitted with the latest in torque and angle testing/calibration equipment.

IS THE TECHANGLE WRENCH "INTRINSICALLY SAFE" (EXPLOSION PROOF)?

No. The TECHANGLE is not sealed tight against volatile atmospheres that may ignite should a spark be generated in its electrical circuitry.

CAN THE TECHANGLE WRENCH BE AUTOCLAVED?

No. Sterilization temperatures and humidity of that level will destroy the wrench.

WHAT ARE THE OPERATING TEMPERATURE LIMITATIONS?

The TECHANGLE wrench was tested between zero and 50 degrees Celsius, (32 and 125 degrees Fahrenheit). Although the wrench does work at those extremes, the LCD (LIQUID Crystal Display) will get sluggish as the temperature drops and the circuitry will drift out of ASME Standard specifications, which is within 10 degrees C of room temperature (23 degrees C).

CAN THE TECHANGLE WRENCH BE USED IN THE RAIN?

The TECHANGLE wrench assembly uses "O" rings and close fit components to minimize dirt and grime getting inside. For that reason, it is also claimed to be "splash proof." However, because the rigid bezel (electronics and display) assembly must be able to float over the bending steel frame and handle, it is not sealed tight. Therefore, the TECHANGLE wrench must never be immersed in any liquid or be directly exposed to moisture that may seep into the electronics.

WHAT IS THE BATTERY LIFE FOR THE TECHWRENCH?

The TECHANGLE wrench was tested continuously with a one second handle vibration every 10 seconds. At this rate, with fresh alkaline cells installed, the battery will operate for over 80 hours. Even with the display off, the circuitry still draws a fraction of a milliamp. Therefore, the battery should be removed when the wrench is stored for an extended period of time.

DOES BATTERY VOLTAGE AFFECT ACCURACY?

No. The TECHANGLE regulates the 4.5V battery voltage to 3V, thus insuring measurement precision. Its micro controller constantly monitors battery voltage as reported by the battery condition flags on the display. Should the battery fall below the regulator dropout voltage, the display will show "bAtt" and the wrench cannot be used until the battery cells are replaced.

WHAT DOES "Err0" MEAN ON THE DISPLAY?

Every time the wrench is turned on, and whenever the ON/RESET key is pressed, the wrench reestablishes a ZERO/TARE for torque. "Err0" (Error Zero) means that a TARE signal, greater than 20% of full scale, is coming from the bending-beam sensor as the wrench is trying to ZERO itself. Such a signal is indicative of torque being applied during ZERO set, a bad gage, open gage wiring, or a permanent set taken by an over-loaded sensor. In any case, the wrench cannot be used and must be repaired.

***IS THE TECHANGLE WRENCH SKYDROL PROOF?
(CHEMICAL RESISTANCE)***

No, practically nothing is Skydrol proof! However, the materials chosen for use in the TECHANGLE wrench have all been proven in existing Snap-on products, such as screwdriver handles, cordless power tools and diagnostic equipment housings. Casual contact, even with the most reactive solvents, has little affect on function or finish. Most chemicals evaporate before doing any damage. The nylon display window will not fog, except due to abrasion. Replacement of the plastic components, should the tool experience damage due to prolonged chemical exposure or physical abuse, is relatively inexpensive. The following plastics materials are used in the TECHANGLE wrench:

Handle and electronics bezel – Nylon, 30% glass filled
End cap, battery tray, trim ring – Polypropylene
Soft grip handle – Santoprene
Display window – Transparent Nylon (Grilamid TR90)
Keypad – Silicone Rubber
Sensor and endcap “O” rings - Buna-N (Nitrile)

Each of these materials was tested by applying chemicals, identified in Snap-on Standard ES60.12J, that are typical of the automotive repair environment, including:

Denatured Alcohol,	#2 Diesel Fuel
30W Motor Oil,	Unleaded Gasoline
Transmission Fluid	Carburetor Cleaner
Naphtha	Brake Fluid (Similar to Skydrol)
Lacquer Thinner	Nitro Methane (Racing Fuel)

SIGNIFICANT RESULTS:

The keypad expands in volume up to 100% when soaked for 24 hours in diesel fuel, naphtha, gasoline and lacquer thinner. However, it returns to normal when the solvents are removed and have evaporated.

According to published data, the soft grip, Santoprene, will expand 3% when immersed into brake fluid for one week and will shrink 15% when immersed into gasoline for one week.

WHAT HAPPENS IF I DROP THE TECHANGLE WRENCH?

All models of the TECHANGLE wrench were drop tested per Government Standard GGG-W-686E with the following results:

One sample wrench was dropped six times, [three times beyond the standard] from four positions horizontally, [three positions beyond the Standard] and once on each end from a height of three feet onto a concrete floor. No failures were noted.

POST DROP TEST CALIBRATION CHECK:

All wrenches remained functional and within accuracy specifications.